DOCUMENT RESUME

ED 252 964 EA 017 475

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TITLE	Class Size.
INSTITUTION	ERIC Clearinghouse on Educational Management, Eugene, Oreg.; National Association of Elementary School Principals, Reston, VA.
SPONS AGENCY	National Inst. of Education (ED), Washington, DC.
PUB DATE	Apr 85
CONTRACT	400-83-0013
NOTE	6p.
AVAILABLE FROM	Publication Sales, National Association of Elementary School Principals, 1920 Association Drive, Reston, VA 22091 ($2.00 prepaid; quantity discounts).
PUB TYPE	Information Analyses - ERIC Information Analysis Products (071) -- Collected Works - Serials (022)
JOURNAL CIT	Research Roundup; v1 n2 Apr 1985
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Administrator Attitudes; *Classroom Environment; *Class Size; Correlation; Cost Effectiveness; *Crowding; Elementary Secondary Education; Literature Reviews; *Meta Analysis; Research Methodology; *Small Classes; Teacher Attitudes
IDENTIFIERS	Class Size and Instruction Project; ERIC Clearinghouse on Educational Management; Virginia Beach Schools VA

ABSTRACT

After a brief introduction identifying current issues and trends in research on class size, this brochure reviews five recent studies bearing on the relationship of class size to educational effectiveness. Part 1 is a review of two interrelated and highly controversial "meta-analyses" or statistical integrations of research findings on class size, by Gene V. Glass and Mary Lee Smith: "Meta-Analysis of Research on the Relationship of Class Size and Achievement," and "Relationship of Class Size to Classroom Processes, Teacher Satisfaction, and Pupil Affect: A Meta-Analysis." Part 2 reviews "An Experimental Study of the Effects of Class Size," by Stan M. Shapson, from "American Educational Research Journal," (Spring 1980). Part 3 is a review of "Early Childhood Education Classroom Evaluation," by Jane Stallings and others. Part 4 covers "Class Size Project 1980-1981: Final Report," by Andrew T. Carrington and others. Part 5 is a review of "Crowding and Classroom Learning" by David E. Weldon and others, from "Journal of Experimental Education," (Spring 1981). (TE)

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R·E·S·E·A·R·C·H roundup

Volume 1, Number 2 April 1985

ED252964

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roundup

Volume 1, Number 2 April 1985

Class Size

Thomas I. Ellis

The question of whether smaller classes are more conducive to effective teaching and learning has stirred perennial controversy among educators for two reasons. The first is that teachers and administrators have strong vested interests in opposite sides of the issue.

Teachers feel, with some justification, that they can do a better job if they have fewer students in each class. Administrators, on the other hand, understandably resist implementation of an across-the-board policy of class size reduction on account of its prohibitive cost. Accordingly, both sides look to researchers to validate their respective claims that class size does or does not make a significant difference in educational effectiveness.

Unfortunately—and here is the second reason the controversy continues—researchers themselves have arrived at no clear consensus because of the nature of the issue. Any attempt to measure the correlation between class size and student achievement must account for—or ignore—a bewildering array of mediating variables.

Attempting to resolve the controversy, Mary Lee Smith and Gene V. Glass, sponsored by the Far West Laboratory for Educational Research and Development, undertook a statistical integration of all reliable research data relating class size to academic achievement, classroom process variables, teacher and student attitudes, and instruction. The conclusion they reached was simple and direct: As class size decreases, educational effectiveness increases, with the percentile curve going up most dramatically below the threshold of 15-20 students.

Far from resolving the issue, the Smith and Glass studies engendered heated controversy over the merits or significance of their "meta-analyses." The Educational Research Service, Inc. found serious fault with their assumptions, their methodology, and the policy implications of their conclusions—on grounds that to statistically integrate findings from such diverse contexts would obscure distinctions and oversimplify a complex and multifaceted issue.

What some observers hold to be a more productive line of inquiry is this: In what contexts are smaller classes most likely to be beneficial? Research along this line seems to have provided some fairly clear guidelines. Several recent studies reveal what appears to be a strong correlation between smaller classes and the development of basic reading and mathematics skills at the elementary level (see studies by Stallings and Carrington, below). This correlation accords with the common-sense proposition that intensive small-group instruction is most valuable when children are developing basic skills.

Few educators would deny the intrinsic importance of favorable classroom environments to the overall educational process. In this context the studies (cited below) by Shapson and by Weldon and others are particularly provocative. Shapson's reveals a disjunction between teacher expectations about the benefits of smaller classes and the data derived from both achievement tests and trained classroom observation. Weldon and colleagues concluded that modifying students' *perception* of density by manipulating environmental and instructional variables might serve as a cost-effective substitute for an actual reduction in class size!

Clearly, the last word on this issue is yet to be heard. Future research must ponder the question: What instructional contexts are most conducive to learning what subjects at what age, and how can schools create those contexts without going broke?

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NAESP

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1 **Glass, Gene V., and Mary Lee Smith.** *Meta-Analysis of Research on the Relationship of Class Size and Achievement. The Class Size and Instruction Project.* September 1978. ED 168 129. And *Relationship of Class Size to Classroom Processes, Teacher Satisfaction, and Pupil Affect: A Meta-Analysis.* San Francisco: Far West Lab. for Educ. Research and Dev., 1979. ED 190 698.

The Class Size and Instruction Project, sponsored by the Far West Laboratory for Educational Research and Development and conducted by Gene V. Glass and Mary Lee Smith, arose as an attempt to resolve the contradictory conclusions that had been drawn from previous reviews of research into class size. Their approach was to undertake a quantitative integration of the existing data from studies of the effects of class size in relation to such variables as student achievement, classroom processes, teacher and student attitudes, and instruction. Because they defined class size as being the ratio of pupils to instructors, they included research into the relationship of achievement and small groups, such as tutorials. They converted all the various types of scores to "achievement advantages," which were then expressed as percentile rankings and grade equivalents, so that data from various studies could be compared.

Their data base of 77 studies were read, coded, and analyzed to yield 725 separate data points, or comparisons of smaller and larger classes. Each study was coded according to five categories of conditions mediating the relationship between class size and achievement: study identification, instructional variables, classroom demographics, study conditions, and outcome variables. The data were then reduced to sets of paired comparisons.

The results can be summarized as follows: (1) average pupil achievement increases as class size decreases; (2) the typical achievement of pupils in instructional groups of 15 and fewer is several percentile ranks above that of pupils in classes of 25 and 30; and (3) achievement appears to increase dramatically only when class size drops below 20. The relationship between class size and achievement is slightly stronger at the secondary level, but it does not differ appreciably across different school subjects, levels of pupil IQ, or several other demographic features of the classroom.

Using data from the previous research, the second report attempted to examine the relationship between class size and such matters as student attitudes and behavior, the quality of the learning environment, and teacher satisfaction. Statistical integration of the extant research indicated that small class size is associated with higher quality classroom environments, better student attitudes, and greater teacher satisfaction. The findings also indicated that the effect of class size in the affective domain is related to the age of the pupils involved, with the impact being most noticeable for children 12 years and under, and least apparent for pupils 18 and over.

2 **Shapson, Stan M.** "An Experimental Study of the Effects of Class Size," *American Educational Research Journal* 17, 2 (Spring 1980), pp. 141-52. EJ 233 227.

This study, sponsored by the Toronto Board of Education, investigated the effects of class size on teachers' expectations about its effects, the attitudes and opinions of both students and teachers, student achievement, student self-concept, and a variety of classroom process variables.

Sixty-two fourth-grade classes participated in the two-year study. Teachers and students were randomly assigned to classes of four sizes: 16, 23, 30, or 37. For the second year, the same teachers and students were similarly assigned to fifth-grade classes—with the constraints that students not be in a class size of 16 or 37 for both years of the study, and that teachers who taught classes of the two larger sizes during the first year receive classes of the two smaller sizes during the second, and vice versa. Instrumentation consisted of paper and pencil measures of the opinions and attitudes of the participants (students and teachers), formal observation of classroom process variables, and—for the students—standardized achievement tests, a self-concept scale, and an art-and-composition measure.

Prior to the study, teachers believed that smaller classes would allow more individualized programs, more individual attention to students, and a better rapport, resulting in academic improvement and greater self-confidence among students as well as a more relaxed and enjoyable classroom environment. Eighty-one percent of them subsequently reported these expectations to be confirmed by their experience in the study.

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Besides processing documents and journal articles, the Clearinghouse prepares bibliographies, literature reviews, monographs, and other interpretive research studies on topics in its educational area.

Prior to publication, this manuscript was submitted to the National Association of Elementary School Principals for critical review and determination of professional competence. The publication has met such standards. Points of view or opinions, however, do not necessarily represent the official view or opinions of NAESP.

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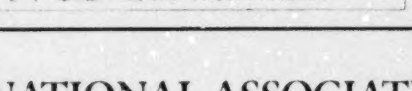

This publication was prepared with funding from the National Institute of Education, U.S. Department of Education, under contract no. 400-81-0011. The opinions expressed in this report do not necessarily reflect the positions or policies of NIE or the Department of Education.

Most other results, however, failed to support the teachers' opinions. Few of the observed classroom process variables (as measured by trained observers using the field-tested Toronto Classroom Observation Schedule) were affected by class size.

The effects of class size on student achievement were similarly inconsequential. Although students' mathematics-concept scores were higher in classes with 16 students than in those with 30 or 37, there were no class size effects for the other achievement measures (reading, vocabulary, mathematics-problem solving, art, and composition), for students' attitudes toward school, or for their self-concepts.

Although the teachers' expectations did not receive much support from the data, the authors advise against ignoring these preconceptions. Class size possibly makes only a marginal difference to students at this age level, but it obviously makes a large difference to teachers—and teacher morale is an important consideration in all policymaking. Also, because no attempt was made to experimentally manipulate instructional strategies, the study considered only "what happens" when class size is changed, and not necessarily "what *can* happen." Indeed, the authors reason, training teachers in instructional strategies for different class sizes may be the best way to reap educational benefits from teachers' preferences for small classes.

3 **Stallings, Jane, and others.** *Early Childhood Education Classroom Evaluation.* Menlo Park, California: SRI International, 1978. 114 pages. ED 210 120.

An evaluation of several federal early childhood education programs in California indicated that, in schools whose students scored at or below the twentieth percentile on the Entry Level Test, third-grade reading test scores were below those predicted for the ensuing three-year period when the students entered school. It should be noted that, although there was an aggregate decline, there were individual schools where the scores had increased, as well as schools in which scores declined. This study investigated the circumstances associated with this decline or improvement in third-grade reading achievement.

A total of 45 third-grade classrooms were observed in seven "increaser" schools and seven "decreaser" schools. The authors' analysis of reading test scores and absence data suggested to them that children are absent less often in classrooms that have a lower ratio of children to adults and in classrooms that are academically oriented.

Correlation and regression statistics were used to study the relationships between classroom instructional processes on one hand and reading achievement and absence rate on the other. Gain was associated with the presence of classroom aides; that is, when the ratio of students to adults was lower, the gain was greater. Greater gain was recorded in classrooms where the teachers formed small groups for instruction and used a direct or very structured method to teach.

4 **Carrington, Andrew T., and others.** *Class Size Project, 1980-1981. Final Report.* Virginia Beach, Virginia: Virginia Beach City Public Schools, August 1981. 59 pages. ED 237 521.

The Virginia Beach City Public Schools Class Size Project was an effort to determine the effect of class size on the reading achievement of first-grade students. The research design consisted of pairs of first-grade classes from eight schools, each with 29 and 21 students respectively. Teachers were randomly selected to participate, and students were grouped heterogeneously. The first graders were then given a pre-test and a post-test to measure their reading achievement gains during the school year. Findings were compared among students as a whole, males, females, whites, and nonwhites.

Acknowledged limitations in the study included its one-year duration, the restricted size of the subject group (335 students in all), and the use of only one instrument of uncertain reliability to measure achievement gains: the norm-referenced California Achievement Test.

Results showed that the reading achievement of first-grade students in smaller classes was significantly higher, on the whole, than that of the students in the larger classes. Both sexes, when measured separately, likewise scored significantly higher in smaller classes than in the larger ones. The same held true for white students taken as a group. Although achievement for nonwhites was not significantly different between small and large classes, this finding cannot be safely generalized, because there were only 32 nonwhite students in all eight schools. The overall findings suggest a reasonably consistent correlation between smaller classes and greater achievement gains in reading for first graders—at least in Virginia Beach.

5 **Weldon, David E., and others.** "*Crowding and Classroom Learning,*" *Journal of Experimental Education* 49, 3 (Spring 1981), pp. 160-76. EJ 246 445.

One characteristic problem with research into the relationship between class size and student achievement is that such research does not and probably can not address the situational variables that directly affect student performance. Accordingly, a research team led by David E. Weldon decided to examine not class size per se, but rather a likely consequence of large classes: the effects of perceived density, or crowding, on students' performance.

Experiment I examined the effects of demographic variables, learning environments, and room designs on perceptions of ideal, crowded, and intolerable learning conditions on the part of four

groups—high school students, teachers, educator-theorists, and administrators. The key word in this formulation is "perceptions," for Weldon and his colleagues presupposed that crowding would affect student behavior or performance only if the students perceived that their "personal space" was being invaded—that is, if they felt crowded. According to this hypothesis, any manipulation of classroom environment that reduces the sensation of crowding is as likely to improve student performance as an actual reduction in numbers.

Such an emphasis on subjective impressions of crowding would seem to call for an examination of actual classroom experience. Instead, however, the setting for this experiment was artificial: Members of the four groups being studied were asked to place model figures in models of classrooms so that the investigators could gain an understanding of what "the concept of crowding" meant to the participants. Using this construct, the participants were asked to create "ideal," "crowded," and "intolerable" learning environments in their respective dollhouse classrooms, under various hypothetical conditions. They were then asked to complete a 20-item questionnaire to assess influences in model placement decisions.

Results indicate that members of the four groups—students, teachers, educator-theorists, and administrators—had no trouble agreeing on what constitutes an ideal learning environment but differed substantially in their perceptions of crowded and intolerable environments. Students placed the fewest figures in the latter two categories, whereas school administrators placed the most, suggesting that as perspective shifts from educational user to educational provider, economic factors play an increasing role in the judgment of crowded conditions.

Significant effects also were observed for the relationship between type of activity to perception of crowding; all participants placed more figures in lecture and study halls than in discussion groups and resource centers.

Experiment II examined the effects of two levels of classroom density on student achievement. Two levels of motivation and three levels of learning environment also were manipulated. Results were consistent with a modified form of Zajonc's theory that the presence of others increases "arousal," which in turn increases performance on simple, well-learned tasks but decreases performance on complex tasks requiring the acquisition of new skills. Findings indicate that moderate levels of density may benefit student achievement.

The researchers also examined actual classroom density and student achievement in two school districts over a 24-year period. They found that classroom density was always within the ideal perceptual ranges established by Experiment I and that it was strongly related to achievement.

Taken as a whole, the findings of these experiments provide useful insights into the complex relationships between classroom density, perception of crowding, and task performance. High density can have either positive or negative effects on task performance depending on the nature of the task. The authors emphasize that the adverse effects were not produced by density per se, but rather by the perceived violations of "personal space" that are more likely to occur in densely populated classrooms. Presumably, then, any manipulation of classroom conditions or activities that reduces perceived or actual violations of personal space will ameliorate the adverse effects of high-density classrooms on student achievement.

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(ISSN 8755-2590)

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